RESEARCH ON IMPACTS

True home IT impact assessments—for example, those that focus on family dynamics, individual outcomes, quality of life enhancements (or dimunitions), and behavioral changes—are scarce. Five categories of impact research were identified and are addressed here:

- time displacement studies,
- the impacts of teleworking on the home,
- psychological well-being,
- informatics and healthcare, and
- the impact of video games on children.

Even within these categories, the amount of research conducted is extremely modest, and an important dimension of impacts and outcomes—the intervening effects of computer-mediated communication on behavior—is not addressed in this research.[23]

TIME DISPLACEMENT STUDIES

Time displacement studies assess the degree to which the introduction of a new technology in a household affects patterns of time use and allocation. Such studies have been done, for example, with respect to vacuum cleaners, automobiles, televisions, and microwave ovens, among other technologies. Three time displacement studies have been conducted with respect to home computing. Two focus on the impacts of home computing and the Internet on the use of traditional news media (newspapers, television, radio, books, and magazines); the other explores how individuals reallocate their time once home computers are brought into the household.[24]

To determine whether use of the Internet and home computers displaces use of traditional news media, Robinson, Barth, and Kohut (1997) analyzed 1994 and 1995 survey data from the Pew Research Center for the People and the Press on IT in the home that show when and how often individuals use different kinds of media. Although they found a variety of correlations, few were statistically significant, of meaningful magnitude, or represented a clear pattern that could not be accounted for by socioeconomic factors. In general, however, the authors found that IT use in the home was associated with a higher use of traditional news media, not lower. They concluded that IT may therefore be media enhancing; it is also possible that home IT users may generally be more "news seeking" than non-IT users. Coffey and Stipp (1997) also found little media displacement between television and PC activity. Using data from PC Meter (a commercial marketing service), they noted indications that use of one medium (the PC, the Internet, and television) tended to reinforce use of the others.

Clemente (1998) analyzed data from the American Internet User Survey conducted by Cyber Dialogue and found patterns of media displacement that tended to support the Robinson, Barth, and Kohut findings. In this study, about one-third of all Internet user households reported that they watched less television, although this displacement tended to be slightly higher for recent adopters than those who had been using the Internet for a year or more. These latter households reported relatively low (from 10–13 percent) declines in reading newspapers, books, or magazines and in listening to the radio.

Vitalari, Venkatesh, and Gronhaug (1985) cast a broader eye on the time allocation impacts of home computing. In a nonprobability study of 282 members of computer clubs in Orange County, California, the authors assessed the impact of computing on 10 household activities: watching television, reading, leisure time spent with family, leisure time spent with friends, outdoor recreation, sports, hobbies, sleeping, time spent alone, and studying/doing homework. Notably, 96 percent of the respondents were men; this, as well as other factors (the majority of respondents had previous experience with computers and also worked in technical professions), make this sample a particularly nonrepresen-

[23]The influence of computer-mediated communication (i.e., communication such as e-mail that occurs via computer) as an intervening factor on social impacts is an important one; but it is outside the scope of this integrated overview. For useful examples of this research, see Parks and Floyd (1995) and Hiltz and Turoff (1993).

[24]Note that time displacement studies are different from simple time allocation studies and diaries. Time displacement research focuses on how the adoption and use of one technology replaces the use of other technologies or reorients household activities; time allocation studies and diaries are simply an accounting of the distribution of household work and activity over the course of a day or week. A major resource for information on time allocation patterns in the home is the University of Michigan's Panel Study of Income Dynamics household time use data <http://isr.umich.edu/srs/psid/index.html>. Although these time use diaries do not include time spent on computing or the Internet, it may be possible to couple these datasets with others that do.

tative group of respondents.[25] Major shifts (e.g., more than 20 percent of respondents reported the change) were detected with respect to decreased television watching, outdoor recreation, hobbies, and sleeping; and increases in time spent alone and studying. (Note that these latter two are not mutually exclusive.) The greatest shifts in time allocation patterns were reported in families with children, suggesting that such households are particularly sensitive to the introduction and presence of a computer.

IT, Work, and Home

Teleworking has long been hailed as one of the major social benefits of IT. By enabling individuals to stay home and work, whether by telecommuting to a parent office or establishing a home-based business, the relocation of work to home is believed to offer multiple advantages to individuals and families. Flexible work hours, lower household costs, less stress from family-work conflicts, and reduced commuting times are among the perceived benefits of computer-based work at home.

The vast majority of the research that has been done to date on teleworking only addresses the economic benefits of these arrangements to parent companies. Impact research on telework similarly focuses on productivity, job satisfaction, work attitudes, job stress, overwork, and employee turnover. Little research has been conducted that focuses on teleworking's impact on home and family life—a deficiency observed by Habib and Cornford (1996), who identify several key areas of concern: the impact on rules, norms, and roles in the household; the blurring of spatial boundaries between home and office; and the disruption of time patterns in family routines. Gurstein's (1991) research on 45 homeworkers echoes similar concerns. Her research indicates that IT homeworkers express guilt at neglecting their families, discomfort with the loss of their home as a "refuge" from work, and a sense of isolation and of being devalued by their office colleagues. Gurstein concludes that home-based computer work "results in role conflicts, inadequate workspaces, the blurring of the work/leisure time division, and the tendency for 'overwork' to occur" (p. 177).

In contrast, Riley and McCloskey (1996) found that limited use of teleworking arrangements may have positive home impacts. Reporting on a pilot program in which GTE Corporation allowed managerial employees to work at home 1 day a week for 6 months, the authors found that "Of the 120 participants in the telecommuting pilot study, 75 percent reported increased feelings of satisfaction with their home life [and] 44 percent reported having more quality time with the family" (p. 87).

These telework studies generally predate widespread access to the World Wide Web and major changes in distributed work arrangements in the private sector. Consequently, they may not reflect the variety of household impacts that come from less insulated work systems. Nonetheless, these studies are suggestive of a common theme in the theoretical and philosophical literature on IT, namely the duality of IT impacts. On the one hand, teleworking can potentially enhance people's ability to better balance work and family needs and reduce personal stress. On the other, home-based IT work can potentially disrupt crucial family dynamics (roles, interpersonal relationships, and the sense of home as a sanctuary) and create psychological isolation and low self-esteem. The extremely limited research presented here suggests that it is not telework per se that can be damaging, but the degree and intensity of its presence in the home.

Psychological Well-Being[26]

As with so many other potential impacts of IT in the home, the influence of computing on the psychological well-being of individuals may be beneficial or harmful. Greater connectedness to a community, ease of communication with family and friends, and improved access to information can enhance self-worth, feelings of satisfaction, a sense of community and kinship, and personal empowerment. Scholars express concern, however, for the "dark side" of computing: isolation, growing social insularity, and—increasingly—"Internet addiction." Although a body of psychobehavioral work exists with respect to computer-human interactions and computer-mediated communication, three empirical works stand out with respect to the psychobehavioral impacts of Internet use. These relate to Internet addiction, social integration, and loneliness and depression.

Although the existence of Internet addiction as a clinical disorder is still in dispute, a number of profes-

[25]In addition, respondents are early adopters of home computers. As others have shown (e.g., Dutton, Rogers, and Jun 1987), such early adopters are atypical of the general population in a variety of ways.

[26]Important, qualitative, case study research exists on the psychological impacts of computing. Seminal works in this area are by Turkle (1984 and 1995); also see Vitalari and Venkatesh (1987) for a conceptual treatment of the psychological dimensions of in-home computing technology and information services.

sionals unequivocally assert that it is a real phenomenon.[27] Egger and Rauterberg (1996) explored data on whether heavy Internet use reflects addictive behavior; their data were obtained from an on-line survey posted and advertised on the World Wide Web. Roughly 450 valid survey responses were received, largely from Swiss and American respondents.[28] Although the findings of the survey cannot be generalized beyond the sample, the key findings are suggestive for future research. First, 10 percent of respondents *perceived* themselves as Internet addicts or dependent upon the Internet, and objective measures of addiction were, on the whole, statistically significant for this group. Second, this small group of Internet addicts represented all walks of life. There were no statistically significant demographic differences between people who could be considered Internet addicts and those who did not—this group could not be differentiated by sex, age, nationality, or living situation.

Concerns that Internet users may be socially withdrawn from their communities were not substantiated by research reported by Katz and Aspden (1997). These authors found—as reported above in the section on Internet use—that, after controlling for demographic differences between groups (age, sex, education, race, and income), there were no statistically significant differences in the degree to which Internet users were members of religious, leisure, or community organizations compared to nonusers. They also found that the vast majority of Internet users (both recent and long term) reported no change in the amount of time spent with family and friends on the phone or in face-to-face contact. Further, the data indicate that long-term Internet users belonged to more community organizations than any other group (nonusers, former users, etc.).

Kraut, Lundmark et al. (1998) found evidence, on the other hand, that greater use of the Internet was not only associated with increased social disconnectedness, but with loneliness and depression as well. Using data from the HomeNet study, these authors found that greater use of the Internet was associated with (1) "small but statistically significant declines" in social integration as reflected by family communication and the size of the individual's social network, (2) self-reported loneliness, and (3) increased depression. These correlations held even after controlling for initial states of loneliness, social involvement, Internet use, depression, stress, and so forth. The authors argue that their methods and findings indicate a *causal* relationship between increased Internet usage, declining social involvement, and worsening psychological states. However, the data cannot establish causality, but can reveal important statistical associations.[29]

Informatics and Healthcare

Patient health informatics are an emerging class of tools designed to help individuals understand their medical conditions and participate more effectively in decisions about treatment and care. Although these tools can be such basic "paper" products as brochures and letters, new interactive electronic media (computerized software and Internet resources) bring IT-based health informatics into the home. The potential quality of life impacts of health informatics for individuals and their families are considerable. But as Hersey, Matheson, and Lohr (1997) discuss, very few assessments of the effectiveness of these tools, both on their own and relative to other media, have been conducted. In their comprehensive review of the literature on the impacts of health informatics on patients, these authors identify only three studies related to the effects of interactive computer-based informatic tools. In all three studies, users of these tools demonstrated substantially higher levels of understanding about their medical conditions and/or treatment choices compared to those who did not use these tools.

Children and Video Games

Although the focus of this integrated overview is on computing technologies and applications, research on the impacts of video games on children is insightful. Not only are video games a form of information technology, but, given the popularity of computer games for children (National Center for Education Statistics data indicated that 80–90 percent of students used the computer for games; NCES 1998), there may be direct implications of video research for computer game behaviors.

This body of research is mixed, like so much of the other assessments of the psychosocial impacts of IT.

[27]See, for example, Young (1998).

[28]The authors were from Switzerland; most of the respondents were Swiss. The survey was posted in both English and German.

[29]The Kraut, Lundmark et al. study does not account for environmental conditions known to trigger social withdrawal and depression (such as loss of a job or marital conflict). Because it does not allow for intervening environmental variables, it ignores the possibility that greater Internet use could be the *consequence* of depression, loneliness, and social withdrawal caused by other factors.

Evidence is found for both positive and negative behaviors associated with the use of video games. There is also evidence of neutral outcomes: these games do not necessarily have any observable effect on children. For example, video game playing does not necessarily make children less sociable (Wiegman and van Schie 1998), but it may encourage them to spend less time on homework, may be addictive for a number of children (just under 10 percent), and may lead them to be more aggressive toward others (Phillips et al. 1995, and Wiegman and van Schie 1998). Video games appear to be more intellectually challenging and stimulating than television, and even though playing video games alone increases with age, children are more engaged with their families and friends when they do play with others (Kubey and Larson 1990). Of greater cause for concern is the strong preference of boys for more aggressive video games, and for these preferences to be associated with more aggressive behavior and reduced sociability (Funk 1993, and Wiegman and van Schie 1998).